

WE CLAIM:

1. A method of controlling a soldering process in a multiple zone conveyor oven, the method comprising:
 - 5 providing an ideal temperature profile for a solder paste to be reflowed in the oven during the soldering process, the temperature profile of the solder paste comprising a preheat phase, a soak phase, and a reflow phase; and
 - applying the ideal profile of the solder paste to the oven by aligning the beginning of each phase of the ideal profile with a forward end of an oven zone so as to form a target profile
 - 10 for use in determining the process settings of the soldering process.
2. The method of claim 1 further comprising manually adjusting the temperature of the target profile at a point where the target profile coincides with the forward end of an oven zone.
- 15 3. The method of claim 1 further comprising determining the temperature set points of the oven zones for effecting the target profile when the solder paste is conveyed through the oven.
- 20 4. The method of claim 3 wherein the solder paste is disposed on a PCB assembly and determining the temperature set points of the oven zones includes accounting for the thermal mass of the cold component and the board thickness of the PCB assembly.
- 25 5. The method of claim 1 further comprising generating multiple profiles in which each phase is aligned with a forward end of an oven zone and selecting the profile that best fits the oven as the target profile for use in determining the process settings of the soldering process.
6. The method of claim 3 further comprising heating the solder paste in the oven and measuring the temperature profile of the solder paste.
- 30 7. The method of claim 6 further comprising comparing the temperature profile of the solder paste to the target profile and if there is any deviation between the temperature profile

of the solder paste and the target profile, automatically adjusting the temperature set points of the oven to account for the deviation and better achieve the target profile upon further operation of the oven.

- 5 8. A method of controlling a soldering process in a conveyor oven having multiple heating zones, the method comprising:
- determining an oven zone coefficient of each heating zone of the oven;
- selecting a solder paste to be reflowed in the oven, the paste having an ideal temperature profile; and
- 10 generating a target profile for the oven by adjusting the ideal profile to fit the zones of the oven.
9. The method of claim 8, further comprising determining the temperature set points of the oven for effecting the target profile when the solder paste is conveyed through the
- 15 oven.
10. The method of claim 8, wherein the ideal temperature profile includes a preheat phase, soak phase, and reflow phase and generating a target profile comprises adjusting the ideal profile so that the beginning of each phase of the ideal profile is aligned with a forward
- 20 end of an oven zone.
11. The method of claim 8 further comprising setting the temperature set points of the oven, heating the solder paste in the oven, measuring a temperature profile of the solder paste as it is conveyed through the oven and displaying the temperature profile of the solder
- 25 paste.
12. The method of claim 8 further comprising automatically setting the temperature set points of the oven.
13. The method of claim 8 further comprising automatically setting the conveyor speed of the oven.
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14. The method of claim 8 further comprising displaying the target profile, the target profile having a vertical axis comprising a temperature scale and a horizontal axis comprising a scale indicating the linear distance through the oven.

5 15. The method of claim 14 further comprising allowing the user to manually adjust the temperature of the target profile at the beginning of one or more of the oven zones through a drag and drop operation.

10 16. The method of claim 13 further comprising displaying the solder paste specification limits with the target profile.

15 17. The method of claim 8 further comprising heating the solder paste in the oven, measuring the temperature profile of the solder paste and if there is any deviation between the temperature profile of the solder paste and the target profile, adjusting the temperature set points of the oven to achieve a profile for the solder paste that substantially matches the target profile upon further use of the oven.

20 18. An apparatus for controlling a soldering process in which solder paste is reflowed in a multiple zone conveyor oven, the soldering process having a preheat phase, a soak phase, a reflow phase and a cooling phase, the apparatus comprising:

means for providing an ideal temperature profile derived from the solder paste specifications of the solder paste to be reflowed in the oven; and

means for generating a target temperature profile for the soldering process in which the beginning of each phase coincides with the forward end of an oven zone.

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19. The apparatus of claim 18 further comprising a database containing solder paste specifications for a plurality of solder pastes and means for selecting a solder paste from the database to be flowed in the oven.

30 20. The apparatus of claim 18 further comprising means for displaying the target temperature profile.

21. The apparatus of claim 18 further comprising means for adjusting the temperature of the target profile at a point where the target profile coincides with the forward end of an oven zone.

5 22. The apparatus of claim 18 further comprising means for determining the temperature settings of the oven zones for heating the solder paste generally in accordance with the target profile.

10 23. The apparatus of claim 19 further comprising means for determining the temperature profile of the solder paste when conveyed through the oven and means for automatically adjusting the temperature settings of the oven to reduce any deviation between the temperature profile of the solder paste and the target profile.

15 24. An apparatus for determining process settings for reflowing solder paste in a multiple zone conveyor oven, the apparatus comprising:

a computer for interfacing with the oven, the computer having means for generating a target profile from an ideal temperature profile of the solder paste to be reflowed in the oven wherein the target profile includes a preheat phase, a soak phase and a reflow phase.

20 25. The apparatus of claim 24 wherein the computer has a display means for displaying the target profile.

25 26. The apparatus of claim 25 further comprising a user interface means operable to permit adjustment of the displayed target profile by an operator.

27. The apparatus of claim 24 further comprising means for calculating the set points of the oven zones for heating the solder paste generally in accordance with the target profile.

30 28. The apparatus of claim 27 further comprising means for automatically setting the set points of the oven.

29. A method for determining the temperature settings of a multiple zone conveyor oven for a heating process in which a part is conveyed through the oven, the process having multiple phases, wherein in each phase the part is heated from an initial temperature to a final temperature, the method comprising:

5 determining a target temperature profile for the part by aligning the initial temperature of each phase with a forward end of an oven zone; and

calculating the temperature settings of each oven zone for effecting the target profile when the part is conveyed through the oven.

10 30. The method of claim 28 wherein the heating process is a soldering process for reflowing solder paste on a PCB assembly, the soldering process having a preheat phase, a soak phase and a reflow phase.